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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[Docket No. 211122-0242]

RTID 0648-XR113

Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the Black Teatfish (*Holothuria nobilis*) as Threatened or Endangered Under the Endangered Species Act

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Department of Commerce.

ACTION: Notice of 12-month finding and availability of status review document for the black teatfish (*Holothuria nobilis*).

SUMMARY: We, NMFS, have completed a comprehensive status review under the Endangered Species Act (ESA) for the black teatfish (*Holothuria nobilis*). After reviewing the best scientific and commercial data available, including the *H. nobilis* Status Review Report, we have determined that listing *H. nobilis* as a threatened or endangered species under the ESA is not warranted at this time.

DATES: This finding was made on [*insert date of publication in the* ***FEDERAL REGISTER***].

ADDRESSES: The *H. nobilis* Status Review Report associated with this determination, its references, and the petition can be accessed electronically online at: *https://www.fisheries.noaa.gov/species/black-teatfish#conservation-management*

FOR FURTHER INFORMATION CONTACT: Celeste Stout, NMFS Office of Protected Resources, 301-427-8436.

SUPPLEMENTARY INFORMATION:

Background

On May 14, 2020, we received a petition from the Center for Biological Diversity to list black teatfish (*H. nobilis*) as a threatened or endangered species under the ESA. The petition asserted that *H. nobilis* is threatened by four of the five ESA section 4(a)(1) factors: (1) the present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial purposes; (3) inadequacy of existing regulatory mechanisms; and (4) other natural or manmade factors.

On August 10, 2020, NMFS published a 90-day finding for *H. nobilis* with our determination that the petition presented substantial scientific and commercial information indicating that the petitioned action may be warranted (85 FR 48144). We also announced the initiation of a status review of the species, as required by section 4(b)(3)(a) of the ESA, and requested information to inform the agency's decision on whether this species warrants listing as endangered or threatened under the ESA. We received information from the public in response to the 90-day finding and incorporated the information into both the Status Review Report (NMFS 2021) and this 12-month finding.

Listing Determinations Under the ESA

We are responsible for determining whether *H. nobilis* is threatened or endangered under the ESA (16 U.S.C. 1531 *et seq.*). To be considered for listing under the ESA, a group of organisms must constitute a "species," which is defined in section 3 of the ESA to include any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate fish or wildlife which interbreeds when mature (16 U.S.C. 1532(16)). Because *H. nobilis* is an invertebrate species, the ESA does not permit listing its populations as DPSs.

Section 3 of the ESA defines an endangered species as any species which is in danger of extinction throughout all or a significant portion of its range and a threatened species as one which is likely to become an endangered species within the foreseeable

future throughout all or a significant portion of its range 16 U.S.C. 1532(6), 16 U.S.C. 1532(20). Thus, in the context of the ESA, we interpret an "endangered species" to be one that is presently in danger of extinction. A "threatened species," on the other hand, is not presently in danger of extinction, but is likely to become so in the foreseeable future (that is, at a later time). In other words, the primary statutory difference between a threatened and endangered species is the timing of when a species is in danger of extinction, either presently (endangered) or not presently but in the foreseeable future (threatened).

When we consider whether a species qualifies as threatened under the ESA, we must consider the meaning of the term "foreseeable future." Regulations at 50 CFR 424.11(d) state that the foreseeable future extends only so far into the future as we can reasonably determine that both the future threats and the species' responses to those threats are likely. What constitutes the foreseeable future for a particular species depends on case-specific factors such as the the species' life-history characteristics, threat-projection timeframes, and environmental variability. That is, the foreseeability of a species' future status is case specific and depends upon both the foreseeability of threats to the species and foreseeability of the species' response to those threats.

The statute requires us to determine whether any species is endangered or threatened throughout all or a significant portion of its range as a result of any one or a combination of any of the following five factors: (A) the present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence (16 U.S.C. 1533(a)(1)). We are also required to make listing determinations based solely on the best scientific and commercial data available, after conducting a review of the species' status and after taking into account

efforts, if any, being made by any state or foreign nation (or subdivision thereof) to protect the species (16 U.S.C. 1533(b)(1)(A)).

To determine whether *H. nobilis* warrants listing under the ESA, we completed a Status Review Report (NMFS 2021), which summarizes the taxonomy, distribution, abundance, life history, and biology of the species. The Status Review Report (NMFS 2021) also identifies threats or stressors affecting the status of the species, and provides a description of fisheries and fisheries management. NMFS then assessed the threats affecting *H. nobilis* as well as demographic risk factors (abundance and trends, population growth rate or productivity, spatial structure and connectivity, and genetic diversity) as part of an extinction risk analysis (ERA). The results of the ERA from the Status Review Report (NMFS 2021) are discussed below. The Status Review Report incorporates information received in response to our request for information (85 FR 48144, August 10, 2020) and comments from three independent peer reviewers. Information from the Status Review Report is summarized below in the **Biological Review** section.

Biological Review

This section provides a summary of key biological information presented in the Status Review Report (NMFS 2021).

Species Description

Sea cucumbers are characterized by a suboval body arched dorsaly and flattened ventrally, a thick and rigid tegument, a large number of ventral podia arranged tightly and without order, small dorsal papillae, and anal teeth (Purcell *et al*. 2012). The mouth, surrounded by tentacles, is ventral (Purcell *et al*. 2012). The main characteristic that distinguishes teatfish from other sea cucumber species is the presence of lateral protuberances ("teat-like") on their body tegument (outer body covering) visible in their live and processed forms (Purcell *et al*. 2012; Conand pers. comm. 2017 in CITES 2019).

H. nobilis is black dorsally with white blotches and spots on the sides of the animal and around the lateral protrusions ('teats'). *H. nobilis* has between 6 to 10 characteristic large lateral protrusions at the ventral margins. The average length of *H. nobilis* is about 35 cm, but has been observed at up to 60 cm. The presence of dorsal podia are sparse and small, while the ventral podia are numerous, short and greyish. The tegument is usually covered by fine sand. The mouth is ventral, with 20 stout tentacles and the anus is surrounded by five small calcareous teeth.

Range, Distribution, and Habitat Use

H. nobilis occurs in tropical coral reef flats and outer reef slopes at depths between 0 and 40 meters, with a preference for hard substrates (Lawrence *et al*. 2004; Idreesbabu and Sureshkumar 2017; Eriksson *et al*. 2012; Conand *et al*. 2013; CITES 2019). While *H. nobilis* has occasionally been observed in seagrass (Purcell *et al*. 2012), seagrass is not considered the desired habitat of the species. Lawrence *et al*. (2004) state that while seagrass beds may be important to most of the main commercial species of sea cucumber, *H. nobilis* is one of the exceptions as it had only been found on coral substrate. Further, *H. nobilis* is considered to be strongly associated with a single habitat variable (*i.e*. hard substrate; Eriksson *et al*. 2012). Thus, the primary habitat for *H. nobilis* is widely considered to be coral reefs (flats/slopes; Conand 2008). *H. nobilis* is commonly seen covered by sand, though this species does not bury itself (Conand 2008). *H. nobilis* is distributed throughout the Indian Ocean, including along the east coast of Africa (Egypt, Sudan, Somalia, Kenya, Eritrea, Djibouti, Tanzania, Mozambique, Zanzibar, and South Africa); the Red and Arabian Seas (Israel, Jordan, Saudi Arabia, Oman, Yemen); and the coastal waters of Madagascar, Mayotte, Mauritius, La Reunion, Seychelles, Comoros, Chagos, Sri Lanka, the Maldives, and the west coast of India (See Figure 5 in NMFS 2021; CITES 2019; Conand *et al*. 2013; Uthicke *et al*. 2004). The species does not occur in the waters of the United States or its overseas territories.

Diet and Feeding

H. nobilis like other sea cucumbers of the order Holothuriida are deposit and detritus feeders. They digest organic matter in the sediment such as bacteria, cyanobacteria, decaying plant matter, copepods, diatoms, foraminiferans, and fungi. Using their retractile tentacles, they ingest the top few millimeters of sediment and excrete less organic rich sediment (Anderson *et al*. 2011; Purcell *et al*. 2016; Webster & Hart 2018).

Reproductive Biology

Teatfish are gonochoristic (*i.e*. separate sex) broadcast spawners, meaning males and females release their gametes into the water column and fertilization occurs externally (Conand 1981; Conand 1986; Toral-Granda 2006). *H. nobilis* do not exhibit sexual dimorphism, and sex of individual animals must be determined through microscopic examination of the gonads.

Teatfish have slow growth rates, maturing at about 3-7 years, and are thought to live for several decades (Conand *et al*. 2013, FAO 2019). Conand *et al*. (2013) reported that *H. nobilis* mature at around 4 years of age. Reproductive fitness is positively correlated with body size, with larger individuals having larger gonads that produce more gametes, thus exhibiting higher fecundity (CITES 2019). As adults, they are non-migratory and relatively sedentary (FAO 2019).

Environmental cues (*e.g*., tidal conditions, lunar phases, temperature fluctuations) and chemical cues trigger the release of gametes (Purcell *et al*. 2010). *H. nobilis* is believed to reproduce annually during the cold season (Purcell, Samyn & Conand 2012; Conand *et al*. 2013; CITES 2019). Successful fertilization depends upon sufficient population density and proximity of adults (Purcell *et al*. 2010; Purcell *et al*. 2011; CITES 2019; FAO 2019). Minimum population densities for successful reproduction have yet to be determined (Purcell *et al*. 2011).

The oocytes of most sea cucumber species, which include teatfish, are small (< 200 μm in diameter) and are neutrally buoyant in the water column (Purcell *et al*. 2010). Fertilized *H. nobilis* eggs quickly develop into free-swimming larvae—sometimes within a day (Purcell *et al*. 2010). These larvae spend 50-90 days in planktonic stage feeding on algae and may be widely dispersed by ocean currents (Conand 2009; Purcell *et al*. 2010; CITES 2019). One breeding trial found that the planktonic period of *H. nobilis* ranged from 44-51 days (Minami 2011). After metamorphosis, sea cucumbers settle on the seafloor (Conand 2009; Purcell *et al*. 2010).

Population Structure

H. nobilis was once considered to be *H. fuscogilva*, another species of teatfish, but was separated in 1980 (Cherbonnier 1980). In 2004, *H. nobilis* was once again separated. *H. nobilis* now only occurs in the indian Ocean, while *H. whitmaei*, occurs in the Pacific Ocean (Uthicke *et al*. 2004). The two black teatfish (*H. whitmaei*, with distribution in the Pacific Ocean, and *H. nobilis*, with distribution in the Indian Ocean) appear to be allopatric with a genetic distance of 9.2 percent, implying a divergence during the Pliocene of approximately 1.8-4.6 million years ago (Uthicke *et al*. 2004). Further molecular analyses support the distinction between *H. nobilis* and *H. fuscogilva* as different species (Ahmed *et al*. 2016). Apart from these genetic data indicating separation of *H. nobilis* and *H. whitmaei* (Uthicke *et al*. 2004), there is very limited additional species-specific information regarding the population structure or genetics of *H. nobilis* populations.

Abundance and Trends

Few standardized datasets documenting changes in teatfish species densities exist for any range countries. This is due mostly to a lack of detailed historical data on early harvests (Friedman *et al*. 2011). Sea cucumber fisheries are largely made up of artisanal fishers living in remote locations far removed from the enforcement of centralized

fisheries management agencies and therefore have generally not been monitored long-term. Additionally, few countries record catches or exports by species, making it difficult to determine the utilization of a single species. Despite sea cucumbers high commercial value, there have been no obvious extirpations of teatfish (type of sea cucumber) species at the national scale. However, declines in densities of teatfish (individuals per hectare) are reported from time series and snap-shot studies, and depletion of stocks have been observed (Kinch *et al*. 2008; Hasan and El-Rady, 2012; Friedman *et al*. 2011; Lane and Limbong, 2013; Ducarme 2016; FAO 2019). It is also important to note that similar to other teatfish species, *H. nobilis* is thought to be naturally rare when compared to other species of sea cucumber (Purcell, pers. comm. 2019 in CITES 2019; CITES 2019; Conand *et al*. 2013; Uthicke *et al*. 2004).

While data on abundance and population trends for teatfish are lacking, they are even more sparse for *H. nobilis* (Anderson *et al*. 2011). The mean density of *H. nobilis* in areas where the species has been observed/surveyed (*e.g*., Chagos, Egypt, Eritrea, Madagascar, Mayotte, Saudi Arabia, Seychelles, Sri Lanka, and Zanzibar) ranges from approximately 0.12 to 10 individuals per hectare (CITES 2019). It is thought that *H. nobilis* once occurred at much greater densities (Conand 2018), with anecdotal reports from sea cucumber collectors indicating that sea cucumbers, in general, were historically larger in size and more abundant (Mmbaga 2013). Throughout the range of *H. nobilis*, this species is considered less abundant relative to previous surveys or anecdotal data or its status is uncertain or unknown based on a lack of data. In fact, in 18 of the 25 countries where *H. nobilis* is reported to occur, the abundance of the species and trends in abundance is very limited or unknown. The information available for the other seven range countries (*i.e*, Chagos, Egypt, Madagascar, Mayotte, Saudi Arabia, Seychelles, and Tanzania) indicates that there are possible declines in abundance with one exception – the Seychelles, where it is reported to be stable (Conand *et al*. 2013, FAO 2019, CITES

2019). Overall, while some quantitative data are available, the abundance and density trends of *H. nobilis* across its range are poorly understood. Abundance information by country is summarized in Table 1 of NMFS 2021.

Extinction Risk Analysis

NMFS relied on the best information available to conduct an extinction risk analysis through evaluation of four demographic viability factors and five threats-based listing factors. In determining the extinction risk of a species, it is important to consider both the demographic risks facing the species as well as current and potential threats that may affect the species' status. To this end, a demographic analysis was conducted for *H. nobilis* and considered alongside the information presented on threats as detailed in the Status Review Report (NMFS 2021).

A demographic risk analysis is an assessment of the manifestation of past threats that have contributed to the species' current status and informs the consideration of the biological response of the species to present and future threats. This analysis evaluated the population viability characteristics and trends available for *H. nobilis*, such as abundance, growth rate/productivity, spatial structure, connectivity, and diversity to determine the potential risks these demographic factors pose to the species. The information from this demographic risk analysis in conjunction with the available information on the section 4(a)(1) factors was then synthesized to determine an overall risk of extinction for *H. nobilis*.

The appropriate time horizon for evaluating whether a species is more likely than not to be at a high level of risk in the "foreseeable future" depends on various case-and species-specific factors. For example, the time horizon may reflect certain life history characteristics (*e.g.*, long generational time or late age-at-maturity) and may also reflect the time frame or rate over which identified threats are likely to impact the biological status of the species (*e.g.*, the rate of disease spread). The appropriate time horizon

coincides with the period of time over which reliable projections can be made as to the specific threats facing the species as well as the species' response, but it is not limited to the period that status can be quantitatively modeled or predicted within predetermined limits of statistical confidence. Reliable projections may be qualitative in nature.

The "foreseeable future" for this extinction risk analysis was considered to extend out several decades (>30 years). Because of the species' life history traits, with longevity estimated to be several decades, age of sexual maturity ranging from three to seven years, density-dependent reproduction and potentially low rates of recruitment, it would likely take more than a few decades for any recent management actions to be realized and reflected in population abundance. Similarly, the impact of present threats to the species could be realized in the form of noticeable population declines within this timeframe, as demonstrated in the available survey and fisheries data (see Populations and Abundance section in NMFS 2021). As the main potential operative threats to the species are overutilization and the inadequacy of existing regulatory mechanisms, this timeframe would allow for reliable predictions regarding the impact of current levels of fishery-related mortality on the biological status of the species. Additionally, this time frame allows for consideration of the impacts on habitat from climate change while the significance of these effects are still uncertain.

The ability to determine and assess risk factors to a marine species is often limited when quantitative estimates of abundance and life history information are lacking. Therefore, in assessing threats and subsequent extinction risk of a data-limited species such as *H. nobilis*, we include both qualitative and quantitative information. In assessing extinction risk to *H. nobilis*, we considered the demographic viability factors developed by McElhany *et al.* (2000) and the risk matrix approach developed by Wainwright and Kope (1999) to organize and summarize extinction risk considerations. In this approach, the collective condition of individual populations is considered at the species level

according to four demographic viability factors: abundance, productivity, spatial structure/connectivity, and diversity. These viability factors reflect concepts that are well-founded in conservation biology and that individually and collectively provide strong indicators of extinction risk.

Using these concepts, we evaluated extinction risk by assigning a risk level to each of the four demographic viability factors and five threats-based listing factors. The levels are defined as follows:

- Low risk: Based on the best available information, it is unlikely this threat is causing negative impacts to the species at the population level throughout its range, such that it is not likely to be affecting extinction risk for the species:
- Moderate risk: Based on the best available information, this threat is likely causing negative impacts to the species at the population level in at least some portion of its range, such that it may be affecting extinction risk for the species; and
- High risk: Based on the best available information, this threat is likely causing negative impacts to the species at the population level throughout its range, such that it is likely affecting extinction risk for the species.

Aditionally, we provided a confidence rating to the impact of each threat as well as the demographic factors based on the available information. The confidence rating scores were adapted from Lack *et al*. (2014) and are defined as follows:

- 0 (no confidence) = No information;
- 1 (low confidence) = Very limited information;
- 2 (medium confidence) = Some reliable information available, but reasonable inference and extrapolation required; and
- 3 (high confidence) = Reliable information with little to no extrapolation or inference required.

We also considered the potential interactions among demographic and listing factors. Finally, we examined the levels assigned to each demographic and listing factor along with the uncertainty rating to determine the overall risk of extinction (see *Extinction Risk Determination* below).

Demographic Risk Analysis

Abundance

As discussed in the Abundance and Trends section of the Status Review Report, across the range of *H. nobilis*, the species is either considered less abundant, or its status is unknown based on a lack of data, with the exception of the Seychelles (see Table 1 in NMFS 2021). In fact, in 18 of the 25 countries where *H. nobilis* is reported to occur, the abundance of the species and trends in abundance are unknown due to a lack of data. Similar to other teatfish species, *H. nobilis* is thought to be naturally rare when compared to other species of sea cucumber (Purcell, pers. comm. 2019 in CITES 2019; CITES 2019; Conand *et al*. 2013; Uthicke *et al*. 2004).

H. nobilis has not been reported to be extirpated from any range countries but has been observed to no longer occur at several survey locations within some some countries across its range, including Geyser Bank in Mayotte and Eel Garden in Egypt (see Table 1 in NMFS 2021; CITES 2019; Conand *et al*. 2013; Uthicke *et al*. 2004). Throughout the species's range, the historical abundance of *H. nobilis* is uncertain, but the abundance of other sea cucumber species have been reported to be declineing (Kinch *et al*. 2008; Hasan and El-Rady, 2012; Friedman *et al*. 2011; Lane and Limbong, 2013; Ducarme 2016; FAO 2019). The available data indicate population declines or possible population declines of *H. nobilis* at survey locations in Chagos, Egypt, Madagascar, Mayotte, Saudi Arabia, and Tanzania. In Chagos at Salomon atoll, there was a decrease in density from 83 ind. ha^{-1} to 10 ind. ha^{-1} from 2002-2006 (Price *et al*. 2010). In Egypt, at Wadi Quny and Eel Garden in the Gulf of Aqaba the species was observed at densities of 0.7 ind. ha^{-1} and 1.3 ind. ha^{-}

[1] respectively in 2002, but were not observed at these locations in 2006 (Hasan & El-Rady, 2012). However, confirmed reports of the species were made off Pharoan Island in April 2015 (Hasan & Johnson 2019) and *H. nobilis* has been reported to be commonly seen by divers as recently as 2019 in Egypt's waters (FAO 2019). For Madagascar, there are anecdotal reports that *H. nobilis* is assumed to be depleted as very few specimens have been seen in the past several years (Conand pers. comm. 2010 in Conand *et al*. 2013). In Mayotte, the species was reported to be observed less frequently in 2016 than in 2005, 2012, and 2015, however, we do not have reported density numbers (Mulochau 2018; FAO 2019). Off the coast of Saudi Arabia, *H. nobilis* was not documented in 2004's harvested species but had been present in the harvest record from 1999-2003. However, in 2006 *H. nobilis* was observed at 3 of 18 surveyed sites along the coast of Saudi Arabia (Hasan 2008; Hasan 2009). For Tanzania, there are anecdotal reports that *H. nobilis* once previously dominated the sea cucumber fishery, but now it is reported to comprise a very small percentage of the total catch (Conand & Muthiga 2007). The abundance of *H. nobilis* in the Seychelles is reported to be stable (Conand *et al*. 2013; FAO 2019; CITES 2019).

Adult density is critical to the species' persistence because the species needs a sufficient density to successfully reproduce (Conand & Muthiga 2007; Purcell *et al*. 2010; Purcell *et al*. 2011). However, due to the limited species-specific information on *H. nobilis* throughout its range it is not possible to determine whether current densities are adequate to allow for successful reproduction. Research is required to determine minimum population densities for positive rates of population growth (Friedman *et al*. 2011). Overall, while some quantitative data are available, the abundance and density trends of *H. nobilis* across their range are poorly understood.

Productivity

Teatfish generally exhibit low natural mortality rates, low to moderate population growth rates, and variable success of larval survival and recruitment, resulting in generally low productivity (CITES 2019; FAO 2019). While larger individuals may be considered highly fecund, teatfish experience high levels of larval mortality (Uthicke, 2004; FAO 2019). Additionally, successful reproduction is highly dependent on adult density (Conand & Muthiga 2007; Purcell *et al*. 2010; Purcell *et al*. 2011). How productivity may affect the extinction risk of *H. nobilis* specifically is challenging to determine given the lack of species-specific information. As stated ealier, there have been documented abundance declines (see Table 1 in MNFS 2021) in Chagos (Saloman Atoll), Mayotte, Egypt (Wadi Quny and Eel Gardens in the Gulf of Aqaba); however, divers have reported commonly seeing *H. nobilis* in Egypt's waters as recently as 2019 (FAO 2019). The remaining 22 range countries do not have species-specific abundance or population growth data. While population declines due to overharvest could negatively affect the species's reproduction and survival, we do not have the data to determine if this is currently affecting *H. nobilis*, as minimum population densities for successful reproduction have yet to be determined (Purcell *et al*. 2011).

Spatial Structure/Connectivity

H. nobilis has a relatively large range, occurring throughout the Indian Ocean, including along the east coast of Africa, the Red and Arabian Seas, the coastal waters of Madagascar and the west coast of India (CITES 2019; Conand *et al*. 2013; Uthicke *et al*. 2004). While there have been reports of population declines, no widespread extirpations or a reduction of range have been reported. Additionally, no information is available on the population structure of *H. nobilis* within its range or the connectivity of populations throughout its range. We considered using other species of teatfish as a reference for connectivity. Skillings *et al*. 2014, discussed the connectivity of *H. whitmaei* and *H. atra* in the Hawaiian Islands and showed that species with similar range sizes do not predict

relative dispersal ability. Both species appeared to share similar life history traits, similar minimum larval duration, occupy the same habitats, are both wide ranging, and are closely related, yet they did not have similar levels of population structuring based on analyses of their genetic data. Thus, differences in population structure may stem from subtle, species-specific differences in habitat usage, population size, or life history that also have large impacts on genetic structure (Skillings *et al* 2014). Given these species-dependent results, it would be inappropriate to use another species of teatfish as a proxy for determining if current spatial structure and connectivity of populations are contributing to the extinction risk of *H. nobilis*.

Diversity

We could not find any information regarding *H. nobilis* specific genetic diversity. Without any genetic analyses to determine diversity or effective population size, we are unable to conclude whether low genetic diversity is a threat contributing to the species' risk of extinction.

Summary of Demographic Risk Analysis

In the Status Review Report the risk rating to the species for Abundance, Productivity, and Spatial Distribution/Spatial Connectivity was unknown with a confidence rating of 1 and for Genetic Diversity the rated risk to the species was also unknown with a confidence rating of 0. Thus, we conclude that, while *H. nobilis* will likly experience future reductions in abundance due to overutilization for international trade (discussed in the Analysis of Section 4(a)(1) Factors section), we are unable to reliably predict the biological or behavioral response of *H. nobilis* to this change, and we therefore do not have reliable information showing that the magnitude of this change could be sufficient to put the species in danger of extinction now or in the foreseeable future.

Analysis of Section 4(a)(1) Factors

The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

As described in the Status Review Report (NMFS 2021), the available data do not provide us with an understanding of *H. nobilis's* habitat usage, thus, it is difficult to identify any specific present or future threats that may affect the features of the habitat on which the species relies. As an alternative, we focus our discussion in the Status Review Report on threats to coral reef habitat as a whole and while there is clear evidence that coral reefs (*i.e*., *H. nobilis* habitat) will undergo substantial changes due to impacts from ocean warming, acidification, and a variety of other threats, it is unclear whether and to what degree the changes in coral reef composition and ecological function will affect the extinction risk of this sea cucumber species throughout its range. While the habitat complexity provided by the morphological structure of many corals may change due to selective elimination of certain coral species, there is no information to suggest which features of the coral reef or species of coral *H. nobilis* may be dependent on. Consequently, it is difficult to predict how the loss of coral reef habitat or changes in coral reef composition will directly affect extinction risk for *H. nobilis.* We recognize that the changes in coral reef habitat predicted over the next several decades will likely negatively affect sea cucumber populations; but whether these impacts will significantly increase the extinction risk of *H. nobilis* is unclear. Thus, the rated risk to the species assigned in the Status Review Report was unknown with a confidence rating of 1.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The harvest of *H. nobilis* for the purpose of supplying Asian markets with bêche-de-mer (*i.e*., the processed form of sea cucumbers, either boiled, dried, or smoked), is considered to be the greatest threat to the species. This harvest has resulted in declines in local population abundance of sea cucumbers since the early 1990s. Many of the harvested populations of sea cucumbers, including across the range of *H. nobilis*, are

considered either to be fully exploited, overexploited, or depleted (See Figure 8 in NMFS 2021; Purcell *et al*. 2011). Teatfish species, including *H. nobilis*, are largely exploited in small-scale and artisanal fisheries throughout their range. Harvest at these scales has proven difficult to manage, with booms in fishing typically followed by closures or moratoriums on fishing once stocks have been depleted. Overall, there is little international or regional coordination in management of these fisheries (FAO 2019).

We assume that demand for 'high value' sea cucumber species, including *H. nobilis* will continue. The extent to which harvest is impacting *H. nobilis* populations in the Western Indian Ocean is largely unknown, although there are some indications that overharvest may be impacting populations in Chagos, Egypt, Madagascar, Mayotte, Saudi Arabia, and Tanzania as there have been documented declines in abundance.

Additionally, there is a lack of recent fisheries-dependent data as many of the countries have banned sea cucumber fishing, including Comoros, Egypt, India, Mauritius, Mayotte, Saudi Arabia, Tanzania, and Yemen. However, despite these bans, there is evidence of continued fishing pressure on sea cucumbers through illegal, unregulated, and unreported (IUU) fishing. IUU fishing is common in the range of *H. nobilis* (depicted in Figure 10 in NMFS 2021). Evidence of illegal fishing has specifically been documented in Saudi Arabia, Mayotte, Yemen, Egypt, Mauritius, and Tanzania.

Finally, overall and country specific trade data for *H. nobilis* are unknown. The trade value chains and fishery-to-market tracing do not provide species-level data. An estimated 10,000 tons of bêche-de-mer are traded internationally each year, corresponding to about 200 million individuals harvested (Purcell *et al*. 2016). Bêche-de-mer, including *H. nobilis*, are sold primarily to Asian markets in the Hong Kong Special Administrative Region (SAR), Singapore, Taiwan, People's Republic of China, Korea, and Malaysia (CITES 2019; Purcell *et al*. 2012). *H. nobilis* is sold for 20 U.S. Dollars (USD) to 80 USD/kg dry weight, depending on size and condition; prices in Hong Kong

retail markets range from 106 USD to 139 USD/kg dried (Purcell *et al*. 2012). However, this product may now have a higher retail price. Purcell *et al*. 2018 report that demand, and hence prices of most bêche-de-mer species appear to have steadily increased since 2011; however, this study did not cover the value of *H. nobilis*. Being of high value, teatfish species are preferentially targeted by fishers and exporters. While *H. nobilis* may be following similar trends to other 'high-value' species, the lack of species-specific data makes it difficult to know to what extent.

Based on the above information, the rated risk to the species assigned in the Status Review Report was moderate with a confidence rating of 2.

Disease and Predation

The extent to which disease and parasites result in sea cucumber mortality in the wild is largely unknown. The impact of predation as a threat on *H. nobilis* also remains unknown. Thus, the rated risk to the species assigned in the Status Review Report was unknown with a confidence rating of 0.

Inadequacy of Existing Regulatory Mechanisms

The establishment of management strategies for *H. nobilis* has been and still is hindered by a lack of basic biological and ecological information as well as limited information on existing and historical sea cucumber fisheries (Bruckner 2006). The regulatory measures most common in sea cucumber fisheries for the Indo-Pacific are minimum legal size limits, gear restrictions (bans on the use of scuba), requirements for exporters to submit logbooks, and no-take reserves (FAO 2013; Purcell *et al*. 2011). There are sea cucumber fishing bans in place in Yemen, Egypt, Mauritius, Saudi Arabia, Tanzania, and Mayotte (Hasan 2009; Eriksson *et al*. 2012; FAO 2013). Madagascar's sea cucumber fisheries regulate the minimum legal size of capture to 11 cm body length for all sea cucumbers. They also prohibit the use of scuba for the collection of sea cucumbers (FAO 2013). India has banned the export of all wild taken specimens of species listed

under CITES Appendix I, II, and III and heavy fines and imprisonment can be imposed (FAO 2013). The Seychelles has a licensing program that requires an annual sea cucumber fishing and processing license be purchased. Since 2001, a maximum of 25 licenses have been distributed each year. Additionally, fishers' logbooks are required to be submitted regularly. Non-compliance can result in non-renewal of their fishing license (Aumeeruddy and Conand 2008). The assessment of individual species and fishing effort are necessary to determine whether these existing regulations are likely to be effective at maintaining the sustainability of the resources. To date, however, the harvest of *H. nobilis* and its impact on the population has not been assessed.

Another regulatory mechanism that will affect *H. nobilis* is the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)—an international agreement between governments established with the aim of ensuring that international trade in specimens of wild animals and plants does not threaten their survival. *H. nobilis* is newly listed under Appendix II of CITES. In total three species of teatfish were listed under Appendix II of CITES in 2019 (with an effective date of August 2020); *H. whitmaei*, *H. fuscogilva*, and *H. nobilis*. The Food and Agriculture Organization of the United Nations (FAO) establishes an expert Panel in advance of each CITES Conference of the Parties (CoP) to review marine species proposals. This Expert Panel is tasked with assessing proposals from a scientific perspective and in accordance with CITES biological listing criteria (FAO 2008-2021). The assessment of this proposal concluded that *H. whitmaei* met the CITES Appendix II listing criteria, while *H. fuscogilva* did not meet the listing criteria, and a determination could not be made for *H. nobilis* due to insufficient data. However, all three species were listed under Appendix II of CITES under a "look-alike" provision.

Appendix II includes species that are not necessarily threatened with extinction, but for which trade must be controlled in order to avoid utilization incompatible with

their survival. International trade of Appendix II species is permitted when export permits are granted from the country of origin. In order to issue an export permit, the exporting country must find that the animals were legally obtained and their export will not be detrimental to the survival of the species in the wild (referred to as a "non-detriment finding").

The extent to which existing regulatory mechanisms are inadequate to protect *H. nobilis* populations from the main threat identified (*i.e.*, international trade) is difficult to evaluate. We concluded that while there are some regulatory mechanisms in place with the intent to control harvest, the enforcement of these regulations is insufficient and may be negatively affecting population abundance. However, because international trade is the main threat to the species (*i.e.*, overutilization for commercial purposes), the new CITES listings may provide some safeguards against future depletion of populations.

While local sea cucumber regulations (*e.g.*, moratoriums, fishing bans, limited entry into the fishery, size restrictions, and gear restrictions) throughout the range of *H. nobilis* may be adequate to protect the species from legal overutilization, the enforcement of these regulations is inadequate as evidenced by the continued IUU fishing that occurs in many parts of the species's range and may be contributing to population declines. Thus, we concluded that inadequacy of regulatory mechanisms presents a moderate extinction risk with a confidence rating of 2.

Other Natural or Manmade Factors Affecting its Continued Existence

We considered factors including bycatch and effects of climate change on *H. nobilis*. However, as the primary habitat of *H. nobilis* is coral reefs, bycatch by trawlers that mainly trawl sea grass habits are not likely to have an effect on the extinction risk of *H. nobilis*. Additionally, the available literature does not indicate that *H. nobilis* has been observed as bycatch in these fisheries (Bruckner 2006). While climate change is a concern, there is a lack of data on how the effects of climate change (warming waters,

acidification, and sea level rise) may affect *H. nobilis*. At this time, we were unable to find any information on other natural or manmade factors that may be affecting the continued existence of *H. nobilis*. Thus, the rated risk to the species assigned in the Status Review Report was unknown with a confidence rating of 0.

Extinction Risk Determination

Guided by the results of the demographic risk and section 4(a)(1) factor analyses above, we analyzed the overall risk of extinction of *H. nobilis* throughout its range. In this process, we considered the best available scientific and commercial information regarding *H. nobilis* across its range, including associated uncertainties, and analyzed the collective condition of its populations to assess the species's overall extinction risk.

Despite much uncertainty due to limited information, it is likely that *H. nobilis* will continue to experience declining trends in its abundance and productivity in the foreseeable future, specifically due to continued overutilization and the lack of enforcement of existing regulatory mechanisms. Whether current protective efforts for *H. nobilis* (*i.e*., the recent CITES listing and fishing bans described above) are or will be effective is uncertain, as described above.

Information on the abundance and distribution of teatfish stocks in general does not indicate any wide-spread extirpations or a reduction of range, although declines in densities of teatfish have been reported from time series and snap-shot studies (Kinch *et al*. 2008; Hasan and El-Rady, 2012; Friedman *et al*. 2011; Lane and Limbong, 2013; Ducarme 2016; FAO 2019). For *H. nobilis* specifically, declines were recorded in several locations, including Chagos, Egypt, Madagascar, Mayotte, Saudi Arabia, and Tanzania. Additionally, a few site-specific surveys within these countries' waters noted an absence of the species; however, the species was still present in other survey locations within those countries. For example, while *H. nobilis* was not found during surveys at Eel Gardens, Egypt, in 2003 or 2006 (Hasan & Abd El-Rady, 2012), the species was recorded

as having a population density of 0.66 individuals per hectare (indv ha^{-1}) for Egypt in 2004 (Lawrence *et al*. 2004), and there areanecdotal data that the species is still commonly seen by divers (FAO 2019). Thus, where there are available species-specific data, those data are largely insufficient to support any firm conclusions regarding the species's status within these locations.

Most of the available data only provide snap-shots of the species (*e.g*, density at a certain location and point in time) and do not allow for species-specific trend analyses across most of *H. nobilis'* range. Additionally, where data do indicate declines of *H. nobilis*, there are insufficient data on what *H. nobilis* densities should be to ensure reproductive success and sustainable populations. For example, in Chagos, the mean density of *H. nobilis* reported for Salomon Atoll declined from 83 ind. ha-1 in 2002 to 10 ind. ha-1 in 2006, with the authors of the survey indicating concern for the species. Yet, the mean density for the Seychelles was reported as 2.0 ind. ha-1, with this population considered to be under exploited (Aumeeruddy & Conand 2008). However, for most of the range, specifically 18 of the 25 countries where *H. nobilis* is reported to occur, species-specific information on the current as well as historical densities is are unknown.

Although *H. nobilis* is considered a 'high value' species, reliable catch and trade data for *H. nobilis* are limited. Most of the available data are not species specific but pertain to sea cucumbers, in general, which includes approximately 1700 extant species, making it difficult to parse out or determine the impacts of threats on *H. nobilis* and current status. Additionally, we could not find catch or trade data that show *H. nobilis* is the main species targeted throughout its range. In the Maldives and Mozambique, it is reported that *H. nobilis* is one of the top three fished sea cucumber species. In Oman, *H. scabra* was the main targeted sea cucumber species, and in Madagascar *H. nobilis* is only thought to be "limitedly harvested" with *H. fuscogilva* the targeted species.

Furthermore, our ability to make reliable predictions of the impacts of threats and *H. nobilis'* response into the future is limited by the variability in not only the quantity and quality of available data across the species' range regarding its occurrence and the potential impacts to the species from ongoing and predicted threats, but also by the high amount of uncertainty regarding how *H. nobilis* may respond to those threats, given that the demographic information for this species is severely limited. We recognize that a number of sea cucumbers are overfished, but being overfished is not necessarily equivalent to being at risk of extinction.

Given the limitations of the available data, including sparse species-specific information hindering status and trend analyses, significant uncertainty regarding the identification and magnitude of potential threats to the species throughout most of its range, and a lack of demographic data to assess how *H. nobilis* is or may respond to these threats, we are unable to determine, with any confidence, the impact of identified potential threats on the status of the species presently or in the foreseeable future. Thus, we find that the best available commercial and scientific data available do not support a conclusion that *H. nobilis* is at moderate or high risk of extinction currently or in the foreseeable future.

Significant Portion of Its Range

Under the ESA, a species may be listed if it is in danger of extinction or likely to become so within the foreseeable future throughout all or a significant portion of its range. Although the available data do not support a conclusion that *H. nobilis* is at risk of extinction currently or in the foreseeable future based on the rangewide assessment, we examined whether there are any portions of the species' range where *H. nobilis* may be facing elevated extinction risk, and whether any such portions qualify as "significant portions" in order to determine whether the species may qualify for listing on the basis of its status within a portion of its range.

The Final Policy on Interpretation of the Phrase "Significant Portion of Its Range" in the Endangered Species Act's Definitions of "Endangered Species" and "Threatened Species"("SPR Policy," 79 FR 37578, July 1, 2014), partially guided this assessment. Under the SPR Policy, we must determine whether there is substantial information indicating that (1) any portions may be "significant" and (2) the species may be in danger of extinction in those portions or likely to become so within the foreseeable future. The order in which these determinations are made is flexible and typically determined based on the nature of the available information or circumstances for the particular species.

We note that the definition of "significant" in the SPR Policy has been invalidated in two District Court cases that addressed listing decisions made by the USFWS. The SPR Policy set out a biologically-based definition that examined the contributions of the members in the portion to the species as a whole, and established a specific threshold (*i.e*., when the loss of the members in the portion would cause the overall species to become threatened or endangered). The courts invalidated the threshold component of the definition because it set too high a standard. Specifically, the courts held that, under the threshold in the policy, a species would never be listed based on the status of the species in the portion, because in order for a portion to meet the threshold, the species would be threatened or endangered rangewide. Center for Biological Diversity, *et al*. v. Jewell, 248 F. Supp. 3d 946, 958 (D. Ariz. 2017); Desert Survivors v. DOI 321 F. Supp. 3d. 1011 (N.D. Cal., 2018). NMFS did not rely on the definition of "significant" in the policy when making this 12-month finding. NMFS instead examined information relevant to making the second determination by considering whether there may be a concentration of threats in portions of the range and whether the species is at risk of extinction within those portions. When evaluating the threats that *H. nobilis* faces, we considered overutilization for international trade in bêche-de-mer and the lack of enforcement of existing regulatory mechanisms. These two factors are considered the

main threats likely causing negative impacts to *H. nobilis* at the population level in at least some portions of its range (see Table 4 in NMFS 2021).

Based on our review of the available data, these main threats appear to be largely widespread throughout *H. nobilis'* range. Sea cucumbers in general face the threats of overutilization and illegal harvest for the purpose of supplying bêche-de-mer to Asian markets. This demand is ubiquitous throughout the western Indian Ocean (*i.e*. the range of *H. nobilis*; see Figures 8 and 10 in NMFS 2021). Given the wide-spread nature of these threats, we next considered whether the species may be responding differently in certain portions of its range to the point where it may be at risk of extinction from these threats within those portions.

Where species-specific information is available, the data show potential negative responses, as evidenced by population declines, in Chagos, Egypt, Madagascar, Mayotte, Saudi Arabia, and Tanzania. However, as stated previously in the extinction risk analysis, where data do indicate species-specific declines there is insufficient data to indicate the species is facing a risk of extinction in those locations. For example, in Chagos the mean density reported for Salomon atoll in 2002 was 83 ind. ha-1 and in 2006 was reported as 10 ind. ha-1. Although this decline to 10 ind. ha-1 could potentially be a cause for concern, in the nearby Seychelles, a mean density of 2.0 ind. ha-1, reported during a 2003-2004 survey, was considered to represent an underexploited *H. nobilis* population. Additionally, there are only anecdotal data for declines in Tanzania and Madagascar. Without additional information on minimum density thresholds or the reproductive potential or current productivity of *H. nobilis*, the available information does not allow us to conclude that these populations may be in danger of extinction. Furthermore, sea cucumber fishing is currently prohibited in Egypt (first in 2001-2002 and reinstated in 2003), Mayotte (since 2004), Saudi Arabia (since 2006) and Tanzania (since 2006). While illegal and unregulated fishing is an issue for sea cucumbers, these fishing bans

should be reducing fishing pressure on the species, and, thus, potentially decreasing the species's risk of extinction in these areas.

While there are limited data on the locations listed above, demographic data to determine how *H. nobilis* may be responding to these threats are largely lacking. As a result, we are unable to determine the extinction risk of *H. nobilis* in any portion of its range. Thus, we are unable to conclude that the species may be at a moderate or high risk of extinction in any portion of its range or likely to become so within the foreseeable future. Because we have made this determination, we did not separately examine whether any portions qualify as "significant." Furthermore, such an analysis would likely be challenged by the same type of data limitations, such as lack of understanding of population structure, population connectivity, and species-specific abundance data, and as a result, prevent a conclusion regarding whether any portions are biologically important such that they qualify as "significant portions" of the species' range.

Final Listing Determination

Section 4(b)(1) of the ESA requires that NMFS make listing determinations based solely on the best scientific and commercial data available after conducting a review of the status of the species and taking into account those efforts, if any, being made by any state or foreign nation, or political subdivisions thereof, to protect and conserve the species. We have independently reviewed the best available scientific and commercial information, including the petitions, public comments submitted on the 90-day finding (85 FR 48144, August 10, 2020), the Status Review Report (NMFS 2021), and other published and unpublished information. We considered each of the statutory factors to determine whether each contributed significantly to the extinction risk of the species. As previously explained, we could not identify a significant portion of the species's range that is threatened or endangered. Therefore, our determination is based on a synthesis and

integration of the foregoing information, factors and considerations, and their effects on the status of the species throughout its entire range.

We have determined the species does not warrant listing at this time. This finding is consistent with the statute's requirement to base our findings on the best scientific and commercial data available. Given the limitations of the available data, including sparse species-specific information hindering status and trend analyses, significant uncertainty regarding the identification and magnitude of potential threats to the species throughout most of its range, and a lack of demographic data to assess how *H. nobilis* is or may respond to these threats, we are unable to determine, with any confidence, the impact of the identified threats on the status of the species presently or in the foreseeable future. Therefore, *H. nobilis* does not meet the definition of a threatened species or an endangered species and does not warrant listing as threatened or endangered at this time.

This is a final action, and, therefore, we are not soliciting public comments.

References

A complete list of the references used in this 12-month finding is available at *https://www.fisheries.noaa.gov/species/black-teatfish#conservation-management* and upon request (see **FOR FURTHER INFORMATION CONTACT**).

Peer Review

In December 2004, the Office of Management and Budget (OMB) issued a Final Information Quality Bulletin for Peer Review establishing minimum peer review standards, a transparent process for public disclosure of peer review planning, and opportunities for public participation. The OMB Bulletin, implemented under the Information Quality Act (Pub. L. 106-554) is intended to enhance the quality and credibility of the Federal Government’s scientific information, and applies to influential or highly influential scientific information disseminated on or after June 16, 2005. To satisfy our requirements under the OMB Bulletin, we obtained independent peer review

of the Status Review Report. Three independent specialists were selected from the academic and scientific community for this review. All peer reviewer comments were addressed prior to dissemination of the final Status Review Report and publication of this12-month finding.

The Peer Review Report can be found online at : *https://www.noaa.gov/organization/information-technology/information-quality-peer-review-id422*.

Authority

The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.).*

Dated: November 29, 2021.

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[FR Doc. 2021-26178 Filed: 12/1/2021 8:45 am; Publication Date: 12/2/2021]